

## DIGGING THE PANAMA CANAL

EVER since explorers found that only a few miles of land separated the Atlantic and Pacific Oceans between the two continents, men have spoken of joining these two oceans by digging a canal. It was evidently so expensive and so difficult that no real attempt was made until about thirty years ago, when a French company secured from the Republic of Colombia the right to dig a canal through the Isthmus of Panama. At the head of the company was Ferdinand de Lesseps, who had succeeded in separating Africa from Asia by means of the Suez Canal, and spurred on by his success in this great work, he felt sure that he could accomplish this task on the other side of the world.

It was found, however, that the two pieces of work could not be compared. The Suez Canal is only a great ditch through the sand or through shallow lakes. While the weather is hot the climate is not particularly unhealthy for Europeans and workmen could be secured from the neighbouring tribes.

In Panama tropical conditions prevailed. During the rainy season vegetation grew up almost in a night, drainage was difficult and it was found that many men engaged on the work died. Mountains had to be dug through. The attempt to get the inhabitants of the district to work was unsuccessful. Why should they work? The soil was so rich that a few hours' work in the course of a month would furnish abundant food, and therefore they could see no reason why they should work, hour after hour in the rain or the sun, carrying away soil, blasting the rock and doing the other hard tasks which are necessary to be done.

At first it had been announced that \$120,000,000 would be sufficient to do the work; then the larger sum of \$180,000,000 was announced, and finally it was seen that this latter sum would not begin to see the work com-

pleted. Though Mr. De Lesseps' plans were good and though much of the work done was well done, some bad men got control of the company, much money was stolen and the company was thrown into debt. Finally De Lesseps was arrested, though it seems that he himself had not been guilty of dishonesty. The French people would not put any more money into the Canal and so for several years the whole plant lay idle. The houses of the Canal workmen were hid in vines in the undergrowth which sprang up. It seemed that all traces of the French attempt were to be wiped out.

Meanwhile in this country there was a great interest in the Canal and this interest grew as our Western states developed. Some men wished to buy out the French company and continue the work across the Isthmus of Panama. Others preferred to cross the Isthmus of Nicaragua, further to the north. Here the distance between the Atlantic and Pacific was much wider, but it was expected to make a large lake and a river a part of the Canal.

Another marvellous project was to cross the Isthmus by means of a ship railway. An immense frame or cradle capable of receiving the largest ship was to be constructed. This was to be mounted upon many-wheeled trucks running upon several railway tracks. These tracks on each side of the Isthmus were to extend into the sea. The cradle would be pushed out into the water, the ship was to sail in and the powerful engines would then draw the trucks out upon the land and carry the ship over to the other side of the Isthmus, where it would be lowered into the sea.

Finally, after much discussion, the Panama route was chosen, the French Company was bought out for \$40,000,000 and the United States was ready to begin. Just then the Republic of Colombia seemed to intend to go back

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upon the bargain it had made and to charge the United States a much higher price than had been agreed upon for the right to cut the Isthmus. The citizens of the Isthmus were unwilling to see so much money lost and therefore they suddenly declared themselves independent of Colombia in 1903, and created the Republic of Panama. An agreement was immediately made with the new republic. The United States agreed to pay \$10,000,000, and after ten years had passed to pay \$250,000 a year.

The building of a sea-level canal was at first mentioned, but soon, though less than half of the committee which had charge of the work reported in favour of a lock canal, it was decided to build the latter type, that is to say, a canal which is not level all the way across but one in which the boats are raised by means of locks as explained in another part of our book. The Republic of Panama gave to the United States for a hundred years a strip of land five miles wide on each side of the Canal. This is called the Canal Zone. Also the privilege of controlling the health conditions of the cities of Colon and Panama was granted, though the United States has nothing to do with the government of these cities outside of the health matters.

Now let us see what has been done. Beginning in Limon Bay on the Atlantic side near Colon, the Canal extends 500 feet wide and 41 feet deep to Gatun, about seven miles away. Here are the first locks, three of them. A great dam, which is more like a hill, is being thrown across the valley of the River Chagres. This hill is so thick and contains so many million loads of earth and stone that it is not believed that the force of the water can ever break it, though the river sometimes rises 25 feet in 24 hours. This dam makes a great lake of the surrounding country and through this lake the width of the channel is for a part of the time more than one thousand feet.

The most interesting part next to the building of the great dam is possibly Culebra Cut, where the Canal cuts directly through a mountain. We show you a picture of this and it will make

you realise how small men are. This work is done by means of steam shovels which are also shown you in the picture. These great machines run by engines scoop into the side of the hill, gathering up hundreds of pounds of dirt, soft rock and shattered stone. The man in charge with a little twist of the wrist turns the great scoop so that it drops its load into a car standing near. When the train is full the engine pulls it off to a section which it is desired to build up rather than to cut down.

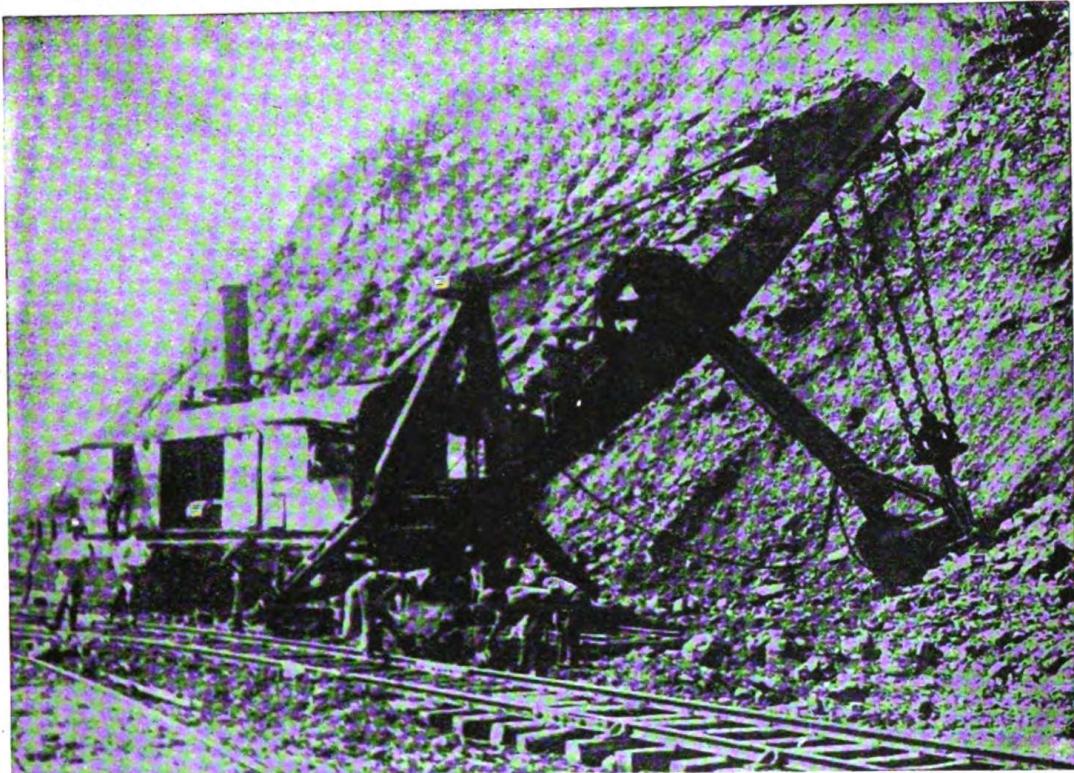
The steam shovels are of various sizes. The one called the "95-ton shovel" seems to do the best work. This carries as high as five cubic yards at a time. When a rock is too large to go inside the shovel it is blasted into smaller fragments. The trains which carry away the dirt and rock are very long as it is sometimes necessary to carry the material many miles. Some of it is used in filling in swamps, and much is used to extend the breakwater upon the Pacific side.

In 1855 a railroad was constructed across the Isthmus and this road is now owned by the Government. The change in the plan of the Canal would bring a large part of the tracks under water and therefore a new line has been laid out for it. Much of the material taken from the great cuts is used to make embankments for this road. Every important appliance is in use in the work. When enough material has been dumped in any one place, by a very ingenious contrivance the whole railroad is lifted up and moved several feet to the right or left as the case may be. Of course this work is slow and the track is not very smooth. There are dozens of these temporary railroad tracks along the Canal occupying one position to-day and an entirely different one next week.

Culebra is the most difficult and most uncertain part of the work, for just when the men who are digging think they have gone far enough the earth slides down from the sides and must be slowly and carefully taken away. These slides must come to an end sometime, but how soon no one can predict.

Though the actual work in digging the Canal is very wonderful, far surpassing

## THE MONSTER THAT EATS THE HILLS



Without the steam shovel such a work as the Canal could never be accomplished. Here you see the great scoop holding five cubic yards, gathering up earth and broken stone.

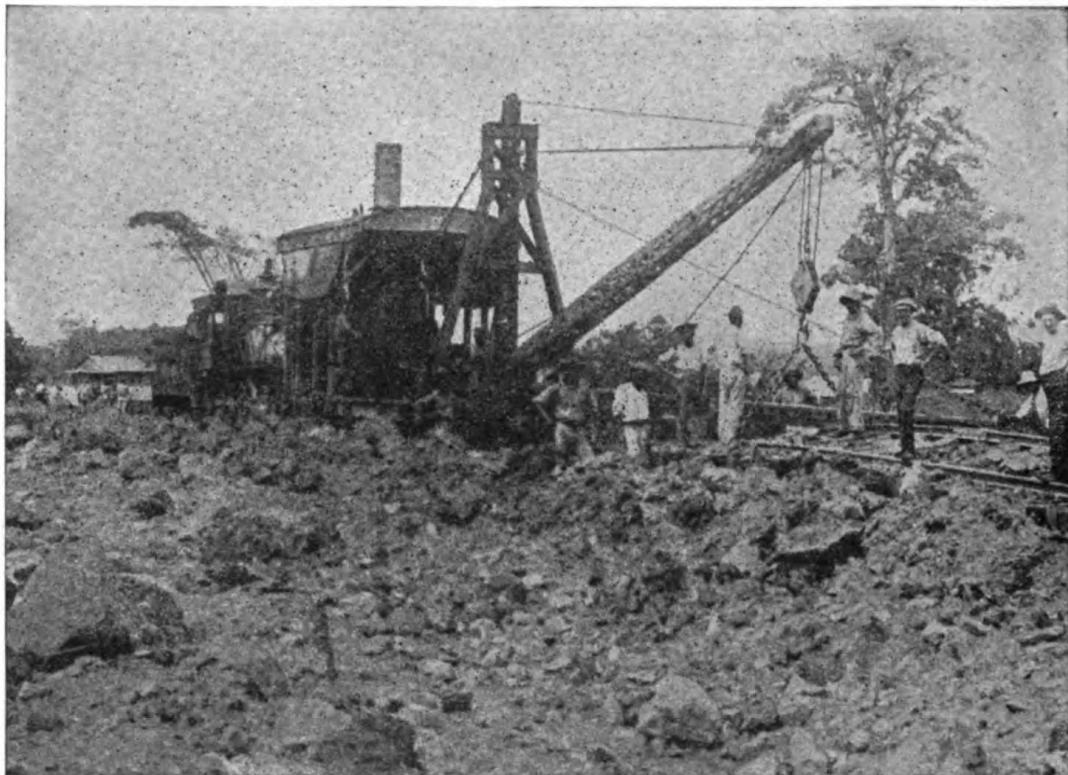


The man in charge of the steam shovel, by moving the lever, raises it, and the great scoop swings around and deposits its load in a dump car. When all the cars of the train are full the engine draws them to a place where it is desirable to fill in rather than to dig out.

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anything which has ever been accomplished before in the history of mankind, the work of the Government in making the Isthmus healthful and in taking care of its army of labourers is even more surprising. Years ago both Panama and Colon were subject to yellow fever which at times almost paralysed business. Since it has been discovered that yellow fever is always caused by the bite of a particular kind of mosquito the Government engineers have had a basis upon which to work. They have installed a complete system of sewerage

ful. Over two thousand buildings were constructed, including offices, hospitals, hotels, kitchens, shops and barracks. Many of the buildings left by the French company were repaired and made of use. It was decided, in order to be sure that the men should have a supply of well cooked and suitable food the Government must undertake the work. Good wages are paid to the labourers and they are furnished with excellent meals at low prices. Provision was also made for the men who occupied more responsible positions. They were



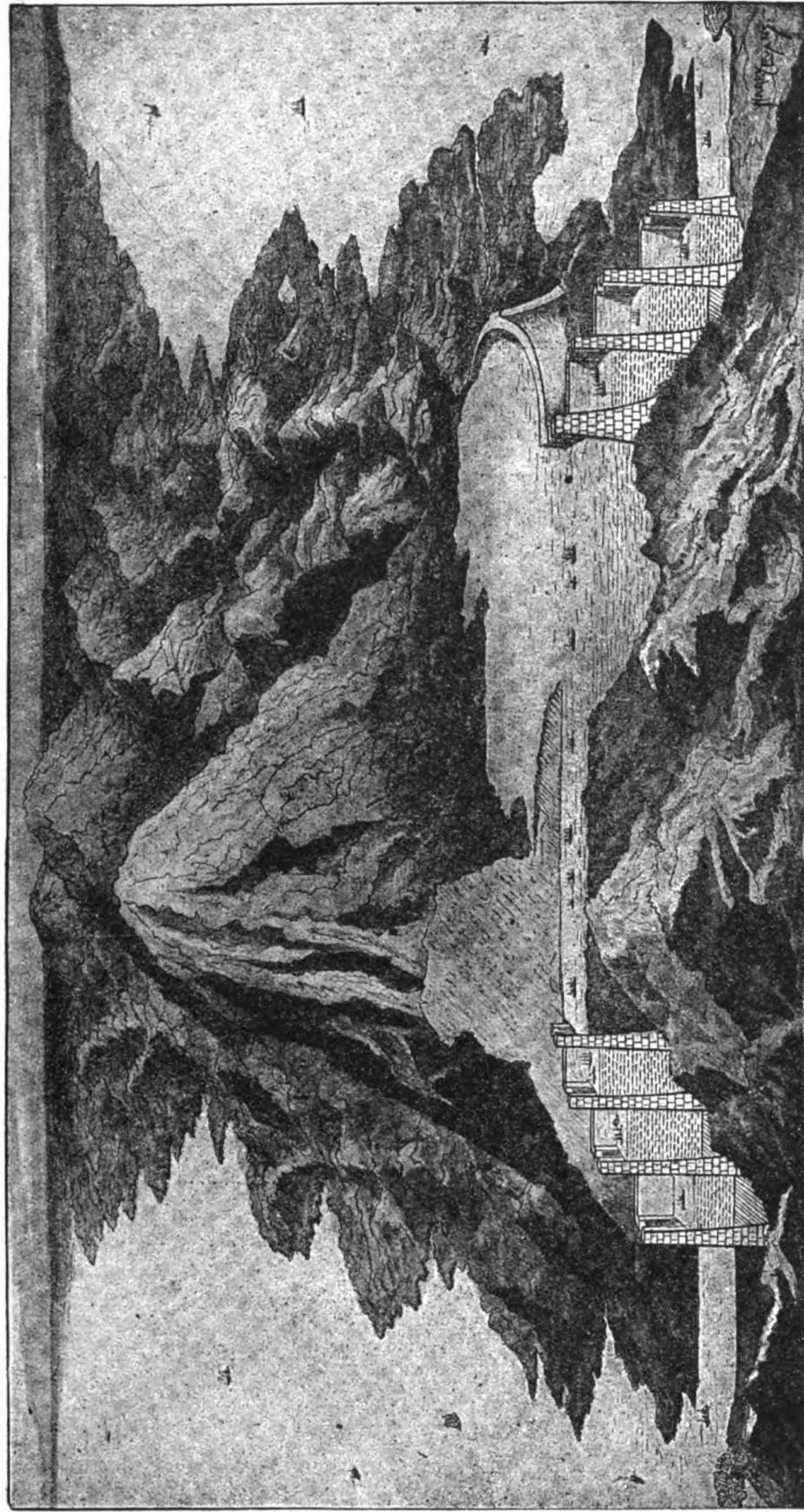
In the great Culebra Cut are dozens of temporary railroad tracks placed so that the steam shovels can reach the banks. When necessary to dig in a new place, this machine, known as a track-shifter, picks up the track, ties and all, and moves it to whichever side is desired.

in the two cities, have caused the streets to be paved and have prevented the collection of heaps of garbage and stagnant water in which mosquitoes might breed. They have kept the under-growth cut down along the canal and last year spent \$43,000 for crude oil with which to spray the ditches, thus killing the young mosquitoes. As a result yellow fever has become almost unknown in the whole Isthmus. Before any actual work was done upon the Canal nearly two and a half years were spent in this work of making the region health-

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encouraged to bring out their families. The single men live in barracks or cottages and board at the hotels under Government supervision. The married men are furnished with quarters and have the privilege of buying direct from the Commissary Department. This Commissary Department is a very important feature and controls several important manufacturing plants. It is in reality a great department store. It controls an ice plant which turns out about 90 tons of ice a day. It bakes 14,000 loaves of bread, makes 250

THE WONDERFUL STEPS OF WATER UP WHICH GREAT SHIPS WILL CLIMB



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This striking picture gives us a vivid idea of how the new world will be cut in two by the Panama Canal, and how the biggest ships will climb up the hills and steam right through the Culebra mountain from one ocean to another, making, from point to point, in a few hours a voyage that formerly took many weeks. There are three great locks at each end of the canal, and these will work on exactly the same principle as ordinary canal locks, only they will be the most wonderful locks the world has ever known. Of course this picture is not drawn to scale. The artist has had to compress the canal in order to show us clearly its most important parts. When the great work is finished, the commercial routes will be shortened by thousands of miles.

gallons of ice cream, roasts a thousand pounds of coffee and is able to take care of 7,500 pieces of laundry a day. Refrigerator cars run from its cold storage warehouses to different parts of the Zone and every morning the supply train leaves the central point, depositing such goods as are wanted at the local commissary stations, where the employees, hotels, etc., can make their purchases. Excellent hospital accommodations are provided at Ancon and Colon. As a result of the vigilance which has been exercised by the sanitary department, health conditions are better than in many American cities.

In the messes arranged for the men the division is by the coin in which the men are paid. One set of accommodations is provided for those on the "gold roll" and another for those on the "silver roll." Generally Americans and Europeans are on the gold roll and the West Indians and the residents of the Zone are on the silver roll. The meals of those on the silver roll are charged for at the rate of thirty cents while those on the gold roll pay forty. In most of the mess halls for the gold-roll employees there are two dining-rooms, in one of which the employees may eat without their coats, as many of the operators and engineers are engaged in work which is dirty. In the Zone all the machinery is on a grand scale. The mixers of concrete for example are so large that a man seems a pygmy beside them. It is estimated that four and a half million barrels of cement will be used in the construction of the work. The concrete is mixed almost automatically. A grab bucket darts down into a pile of sand, fills itself, runs back along an overhead track and drops its load into the mixer. Meanwhile another goes for a load of stone. The cement has already been emptied from sacks or barrels. On the Pacific side the two principal locks by which our ship descends from its height are at Miraflores. Here the Canal drops fifty-five feet. It has already dropped thirty feet at another point. The work at Miraflores has progressed much more rapidly than anyone expected and it is estimated that this work will be finished seven months sooner than had been ex-

pected. The variation in the tide is greater on the Pacific coast than on the Atlantic.

It is estimated that the Canal will cost \$375,000,000 to finish. Such a sum staggers one. In fact, we cannot comprehend this amount of money. It is exceedingly doubtful if the Canal can ever pay a profit. Though the locks can be filled in eight minutes a considerable time is necessary to take a ship through and it is estimated that not more than fifty-eight ships can pass through in a single day of twenty-four hours,—for the Canal will be so brilliantly lighted that ships will pass by night as well as by day. It is probable that the tolls charged can never be large enough to pay a fair rate of interest.

But it was not for direct profit alone that the United States determined to build the Canal. Our ships are at a great disadvantage in trading with Asiatic countries, since our chief seaports are upon the eastern coast and in order to reach these eastern markets a ship must first sail across the Atlantic and through the Suez Canal or else go altogether around South America. It is hoped that the building of the Canal will help very much to develop the Mississippi Valley by allowing to its product a quicker way to market.

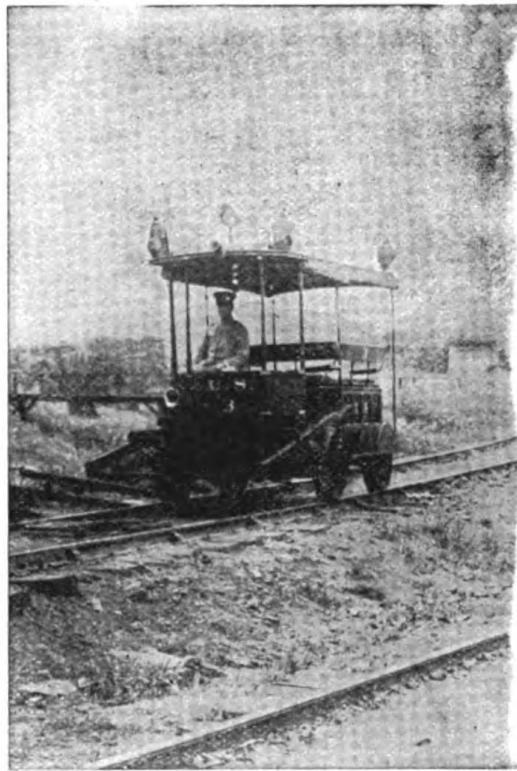
Then, too, the condition of affairs at the beginning of the Spanish-American War has not been forgotten. Then our fleet was divided, and your parents can tell you something of the wonderful voyage of the Oregon around Cape Horn and into the Atlantic Ocean. Without the Canal the United States must keep two fleets, one in the Atlantic and one in the Pacific Ocean. With the Canal ships can be easily transferred from one ocean to the other, and it is thought that the amount saved in naval expenses will easily pay the interest on the bonds which have been sold to build the Canal.

But whether all these expectations are realised or not, it must make us feel proud that our country is doing this great work. Few countries in the world are rich enough to undertake such a work and it is certain that no country could do better than our Government engineers are doing this stupendous task.

## SCENES ALONG THE ZONE



When the French Company became bankrupt in 1889 much of the machinery was left on the ground. Here we see hundreds of good locomotives overgrown by vines and eaten up by rust.



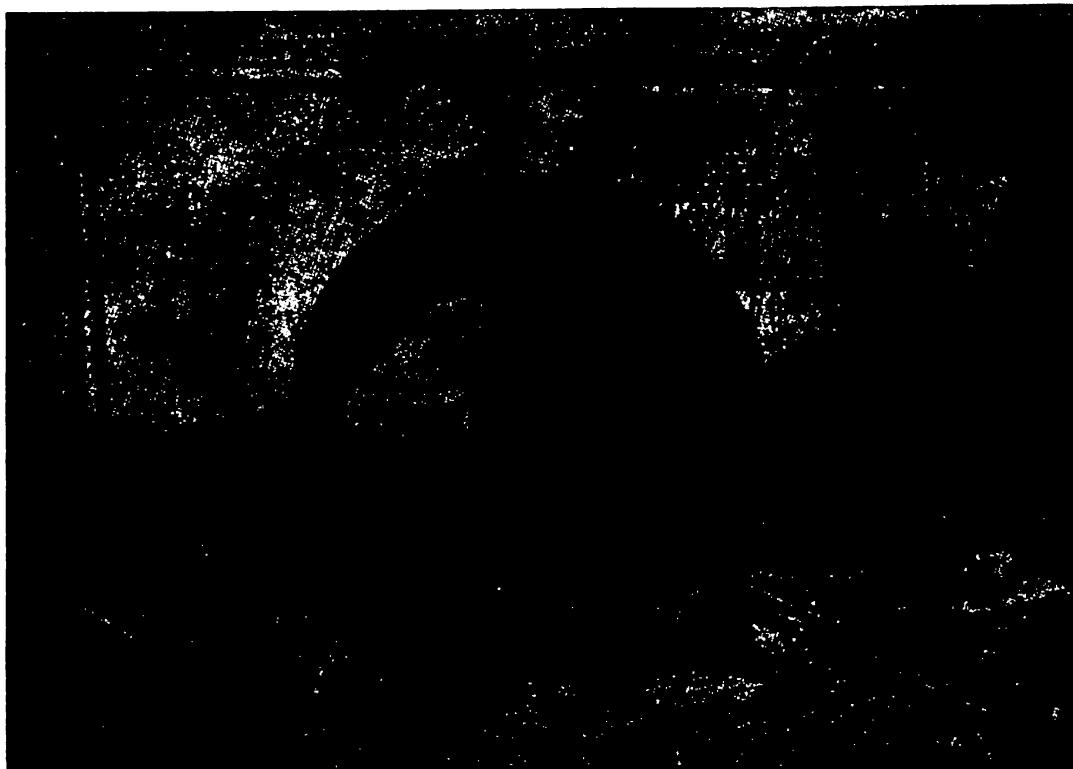
The engineers and supervisors move from one part of the work to another in the railroad automobile, a picture of which you see here. It is like any other automobile, except that it runs on rails.



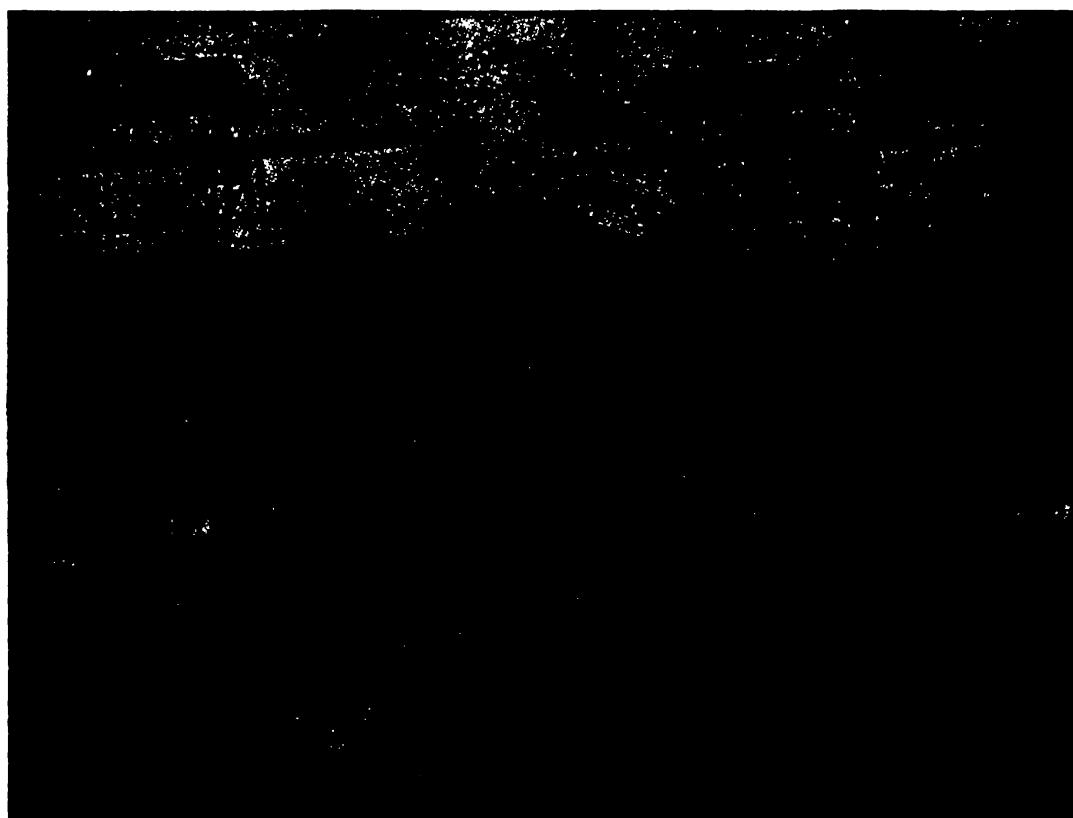
Every provision has been made by the government for the health and comfort of those working on the Canal. Here is a picture of the attractive grounds of the Hospital at Ancon.

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## THE BEGINNING OF THE GREAT LOCKS



Among the most wonderful features of the canal, which in parts is 85 feet above sea-level, are the enormous locks, enabling great ships to climb to the high level. The lock walls are built round great circular iron shapes like this.



Here we see the mighty walls growing up, and the towering cranes by which the masonry is laid in position. By building round circular iron frames a tunnel passage is left in the wall, through which the surplus water will flow.